Perceived Dental Pain: Determinants and Impact on Brazilian Schoolchildren

Helena Silveira Schuch, DDS, MSc
PhD Student
Post-Graduate Program in Dentistry
Federal University of Pelotas
Pelotas, RS, Brazil
Australian Research Centre for
  Population Oral Health (ARCPOH)
School of Dentistry
The University of Adelaide
Adelaide, SA, Australia

Marcos Britto Correa, DDS, MSc, PhD
Post-Graduate Program in Dentistry
Post-Graduate Program in Epidemiology
Federal University of Pelotas
Pelotas, Brazil

Dione Dias Torriani, DDS, MSc PhD
Post-Graduate Program in Dentistry
Federal University of Pelotas
Pelotas, RS, Brazil

Flávio Fernando Demarco, DDS, MSc, PhD
Post-Graduate Program in Dentistry
Post-Graduate Program in Epidemiology
Federal University of Pelotas
Pelotas, Brazil

Marília Leão Goettems, DDS, MSc, PhD
Post-Graduate Program in Dentistry
Federal University of Pelotas
Pelotas, RS, Brazil

Correspondence to:
Helena Silveira Schuch
Australian Research Centre for
  Population Oral Health (ARCPOH)
The University of Adelaide
Ground Floor
122 Frome Street
Fax: +61 8 8313 34858
Adelaide, SA, Australia
Email: helena.schuch@adelaide.edu.au

Aims: To assess reports of dental pain in a school-based sample of children in South Brazil and test its association with socioeconomic, demographic, psychosocial, and clinical variables. Also, the consequences of dental pain on oral health perception and its impact on daily life were investigated. **Methods:** A two-stage cluster procedure was used to select 1,199 children in 20 public and private schools in Pelotas, Brazil. Children were interviewed to obtain self-reports of dental pain. They were also asked about perception of their oral health and dental fear. Mothers answered a questionnaire on socioeconomic characteristics. A clinical oral examination was conducted to assess dental caries, malocclusion, and dental trauma. Multivariate Poisson regression analysis was used to investigate factors associated with dental pain in the previous 6 months and its effect on oral health perception. **Results:** The prevalence of dental pain was 35.7% (95% confidence interval [CI] 33.0–38.5) in the previous 6 months. A higher prevalence of dental pain was observed for children from lower-income families (prevalence ratio [PR] 1.39; 95% CI 1.10–1.76), for girls (PR 1.24; 95% CI 1.06–1.46), for those living in overcrowded houses (PR 1.23; 95% CI 1.01–1.49), for those who reported dental fear (PR 1.19; 95% CI 1.00–1.42), and for those with caries experience (PR 1.57; 95% CI 1.34–1.84), after adjustments. Dental pain presence influenced oral health perception (PR 2.56; 95% CI 1.55–3.29) and impacted the children's daily life (PR 1.89; 95% CI 1.64–2.17). **Conclusion:** A high percentage of schoolchildren suffered from dental pain, which was influenced by demographic, socioeconomic, psychosocial, and clinical characteristics, causing a negative impact on oral health perception. *J Oral Facial Pain Headache 2015;29:168–176. doi: 10.11607/ofph.1414*

Key words: *children, dental caries, dental pain, epidemiology, socioeconomic*

Despite the observed decline in the occurrence of many oral health problems, studies conducted with schoolchildren have demonstrated that dental pain is still a common problem in many countries,[1] including Brazil. Slade[2] studied the experience of dental pain by children and adolescents and found a reported lifetime prevalence ranging from 5% to 33% among countries. Dental pain is a public health problem[3,4] because of its high prevalence[5] and its social, psychological, and economic consequences on individuals and communities, which include impairment of the individuals' quality of life and its impacts on the society due to the high costs of treatments required, work or school absenteeism, and increased use of medicines.[6] In children and adolescents, toothache impacts scholarly, physical, and social activities.[7] Because of its consequences, pain has been reported as the main reason for individuals including children to seek dental care.[8–10]

Absence of toothache has been considered an expected outcome indicator of oral health and having no dental pain has been proposed as a predictor of positive perceived oral health.[11] The main causes for dental pain are direct trauma to the teeth or infectious diseases,[12] dental caries being the major reason.[13] In Brazil, most dental cavities remain untreated, both in preschool children and in schoolchildren.[14] In view of this, the abolition of toothache could well be used as an explicit goal by dental health care systems.

In addition to the connection between pain and clinical characteristics, the perception of pain is influenced by cognitive factors, expectations, and beliefs, and by social, psychologic, and cultural factors. Concepts of pain indicate that it has physiologic, psychologic, and emotional components, and experimental studies have demonstrated that previous experience, expectation and anticipation, communication, and control could influence pain perception.[15,16] There is also a relation between dental anxiety and the perception of pain, considering that anxious individuals are more likely than the non-anxious to report pain.[16] These aspects reinforce the role of psychologic factors in pain perception.

Thus, pain is a multifactorial and a multifaceted phenomenon, and several aspects remain to be better understood. There is a complex interplay between individual external factors, such as socioeconomic situation, education, and attitudes toward pain, and internal factors, such as age, gender, psychologic temperament, and an individual's pain perception. In children, the gender, age, and level of dental anxiety are factors that could interact with the perception of pain, and these deserve further investigation.[17]

Since few studies have investigated possible triggering factors for dental pain in schoolchildren, this study aimed to assess reports of dental pain in a school-based sample of children in South Brazil and test its association with socioeconomic, demographic, psychosocial, and clinical variables. Also, the consequences of dental pain on oral health perception and its impact on daily life were investigated. The authors hypothesized that the outcome will be influenced by lower socioeconomic status, dental caries experience, and dental fear, and that dental pain will be related to an impaired oral health perception.

Materials and Methods

Design and Settings
A school-based cross-sectional study was conducted with children who were aged 8 to 12 years, living in the urban area of Pelotas and enrolled in public and private schools in 2010. The study protocol was approved by the Human Research Ethics Committee of Federal University of Pelotas, under protocol no. 101/2009. A description of the methods of this survey was published,[18] and can be accessed for more detailed information.

Sampling Procedures
An estimated minimum sample size was calculated using the Epi Info 6.0 software (Centers for Disease Control and Prevention, Atlanta, GA, USA) and assuming the following parameters: a prevalence of dental pain in adolescents in the previous 6 months of 30%, a standard error of 3 percentage points, a confidence level of 95%, a design effect of 2, and an increase of 10% in the sample size to account for nonresponse; this resulted in a minimum sample size of 1,160 children.

A multistage sampling technique was used for subject recruitment. The first stage comprised 15 public and 5 private schools in Pelotas to ensure proportionality of both types of schools in the city. Schools were randomly selected, with probability proportional to the number of children enrolled in each school. The second stage comprised five 2nd- to 6th-grade classes randomly selected in each school. All children enrolled in the selected classes were eligible for the study. For inclusion in the study, children needed to be at the mixed or permanent dentition stage, with informed consent provided by their parents. Children who were not able to respond to the interview were not included.

Of the 1,744 children eligible for the study, 419 (24.0%) did not have the informed consent form signed by their parents and 114 were absent from the school during data collection (6.7%). Thus, the final sample was 1,211 children (69.4%). This sample size achieved 80% power to detect prevalence ratios ≥ 1.56 as significant, with a confidence level of 95%. Of the 1,211 children included in the study, 12 children did not answer about dental pain, thus the final sample in the study was 1,199.

Data Collection
The study method involved visiting schools at least three times to invite children to participate and ask them to give the informed consent form to their parents; the form explained the aim, features, and importance of the study. The signed forms were subsequently collected, and the schools were visited as many times as needed to ensure that no more than 10% of the children were absent during data collection. Also, quality control was performed by revisiting each school to conduct a shorter version of the interview with 10 children.

Data collection consisted of a socioeconomic questionnaire for parents and interviews and clinical examinations of children. The questionnaire, written in Portuguese (Brazilian), included socioeconomic aspects, such as family income and maternal schooling. The level of the mother's education was evaluated in terms of years of formal education, and family income was measured in Brazilian Reals (R$) and then categorized in quartiles. The children's interview contained demographic information (sex, age, and school grade) and information about the family structure and the number of persons living in the house. Family structure was considered nuclear if the child lived with both parents and non-nuclear if
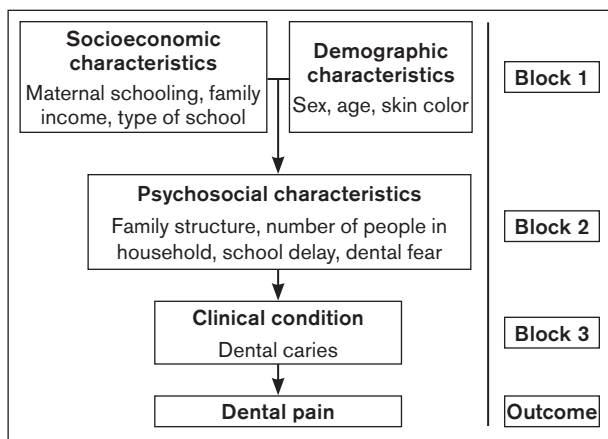
Fig 1 Conceptual hierarchical framework of risk factors for dental pain in children adopted for the statistical analyses.

the child lived with only one of the parents or with a guardian.[19] The number of persons living in the house was collected in continuous form and was categorized in tertiles.[19] A household included all the persons who occupied a housing unit. Children were asked about the impact of their oral health, assessed by means of Locker's global oral health item,[20] as well as an oral health impact item that assessed how much the teeth disturb ("Do not bother," "Almost Nothing," "A little," "Much"). For analytical purposes, answers were dichotomized as: impact absent ("Do not bother"/"Almost nothing") or present ("A little"/"Much"). Oral health perception was assessed using the item: "Do you think your teeth and mouth are" as follows: "Excellent," "Good," "Regular" (positive perception), "Fair or poor" (negative perception); these data were collected by means of the Child Perception Questionnaire 8–10 (CPQ), which was validated by Jokovic et al[21] and adapted to Brazil by Martins et al.[22] Dental fear was assessed using the Dental Anxiety Question (DAQ) ("Are you afraid of the dentist?").[23] The following possible answers were provided: *(1)* No; *(2)* Yes, a little; *(3)* Yes; and *(4)* Yes, a lot. The outcome was dichotomized as "children without dental fear" (for answers 1 and 2) and "children with dental fear" (for answers 3 and 4). School delay was deemed to be present when the relation between age and school grade was considered inadequate according to Brazilian schools.[24] This indicator considers the age 7 as adequate to enter a basic program that comprises 8 years of study. Children responded about the occurrence of dental pain in the last 6 months preceding the survey, using the question: "Have you had toothache in the last 6 months?" with answers being "yes" or "no." The dependent variable was assessed as proposed by the Brazilian National School-Based Health Survey (PeNSE, acronym in Portuguese).[1,25] The skin color was assessed by the interviewer, adopting the classification of the ethnic groups according to the criteria described by the agency for demographic analysis—the Brazilian Institute of Geography and Statistics.[26] According to this criterion, children were classified as "white" (children of European descent) and "non-white" (black children of African and mixed descent).

Training and Calibration Procedures

Six dentists with previous experience in epidemiologic studies performed the oral clinical examination, which was conducted following procedures recommended by the World Health Organization (WHO),[27] in school chairs and with the use of an individual artificial light, a buccal mirror, and WHO probe. Initially, dental caries was assessed, using the DMFT (Decayed, Missing, and Filled Teeth) Index,[27] which measures lifetime dental caries experience in the permanent dentition. The O'Brien Index[28] was used to evaluate the presence of dental trauma, treatment need, and the presence of treatment. Malocclusions were evaluated using the Dental Aesthetic Index,[27] which considers a combination of measures to determine the degree of malocclusion and need for treatment.

Prior to data collection, interviewers and examiners were trained. Initially, examiners and assistants received a theoretical training. After this activity, the fieldwork team practiced carrying out the examination for dental caries and malocclusion for a period of 3 hours with children of the same age group from a school not included in the study. Then, the calibration process took place with four groups each of five children (aged between 8 and 12 years) who were examined by the six dentists and one gold standard examiner with previous experience with epidemiologic studies. For dental trauma, after a theoretical explanation of the criteria, an 'in lux' calibration exercise was performed with 20 pictures. The minimum kappa value achieved in all conditions was 0.62 and mean value was 0.74.

Data Analysis

Data were entered in duplicate using the EpiData 3.1 version (EpiData Association, Odense, Denmark) and analyzed using Stata 12.0 (Stata Corp, College Station, TX, USA). Descriptive analysis was initially performed. To compare proportions of children with pain according to the independent variables, chi-square and chi-square for linear trend tests were used. Bivariate and multivariate Poisson regression analyses[29] were used to obtain the prevalence ratio (PR) and 95% confidence interval (CI) to identify factors significantly associated with the occurrence of dental pain. Adjusted analysis followed a conceptual hierarchical model based on a review of the literature that determined the order of entry of variables into the model to control for potential confounding factors

Table 1 Sample Distribution and Prevalence of Dental Pain in the Previous 6 Months According to Sociodemographic, Biologic, Psychosocial, and Behavioral Variables

Variable	Total		Dental pain		
	n	%	n	% (95% CI)	P
Sex					
Male	568	47.4	178	31.3 (28.6–33.9)	.003*
Female	631	52.6	250	39.6 (36.8–42.4)	
Age (y)					
8	178	14.9	60	33.7 (31.0–36.4)	.032†
9	309	25.8	107	34.6 (31.9–37.4)	
10	294	24.5	93	31.6 (29.0–34.3)	
11	255	21.3	94	36.9 (34.1–39.6)	
12	163	13.6	74	45.4 (42.5–48.2)	
Skin color					
White	847	72.8	287	33.9 (31.2–36.6)	.011*
Non-white	317	27.2	133	42.0 (39.2–44.9)	
School type					
Private	249	20.8	77	30.9 (28.2–33.5)	.077*
Public	950	79.2	351	37.0 (34.3–39.8)	
Maternal schooling (y)					
>12	245	21.0	72	29.4 (26.9–32.1)	.001†
8–12	498	42.8	170	34.1 (31.4.–36.9)	
< 8	421	36.2	175	41.6 (38.9–44.4)	
Family income (quartile)					
1st (R$ 0–510)	243	23.7	74	30.5 (27.9–33.2)	< .001†
2nd (R$ 511–740)	270	26.3	88	32.6 (29.9–35.3)	
3rd (R$ 741–1,230)	239	23.3	98	41.0 (38.2–43.9)	
4th (R$ 1,231–12,000)	274	26.7	120	43.8 (40.9–46.6)	
Family structure					
Nuclear	732	61.1	235	32.1 (29.5–34.8)	.001*
Non-nuclear	466	38.9	193	41.4 (38.6–44.2)	
No. of people in household					
2–4	731	61.7	240	32.8 (30.1–35.5)	.009†
5	229	19.3	86	37.6 (34.9–40.4)	
≥ 6	224	18.9	94	42.0 (39.2–44.9)	
School delay					
No	854	71.5	281	32.9 (30.2–35.6)	.002*
Yes	341	28.5	145	42.5 (39.7–45.4)	
DMFT					
0	810	67.6	240	29.6 (27.0–32.3)	< .001*
≥ 1	388	32.4	188	48.5 (45.7–51.4)	
Dental fear					
No/Yes, a little	900	75.4	302	33.6 (30.9–36.3)	.007*
Yes/Yes, a lot	293	24.6	124	42.3 (39.5–45.1)	
Oral health impact					
Do not bother	465	38.9	88	18.9 (16.7–21.3)	< .001†
Almost nothing	233	19.5	76	32.6 (29.9–35.3)	
A little	425	35.6	211	49.7 (46.8–52.6)	
Much	71	6.0	51	71.8 (69.2–74.3)	
Oral health perception					
Excellent/Good	399	33.3	126	31.6 (29.0–34.3)	< .001†
Regular	679	56.7	235	34.6 (31.9–37.4)	
Fair/Poor	120	10.0	67	55.8 (52.9–58.6)	
Total	1,199	100.0	428	35.7 (33.0–38.5)	

*Chi-square test.
†Chi-square test for linear trend.
1R$ (Brazilian Real) = 0.54US$; DMFT = decayed, missing, and filled teeth.

(Fig 1). The first level included socioeconomic and demographic variables; the second level included psychosocial characteristics; and the third level included biologic characteristics. Variables were adjusted for those in the same and upper levels.

To assess the effect of dental pain on oral health perception and on oral health impact, crude and adjusted Poisson regression analyses were performed. Considering that family income, sex, age, family structure, household crowding, DMFT, dental trauma, and malocclusion could also affect oral health perception, results were also adjusted for these characteristics.

Results

Table 1 presents the distribution of the sample according to independent variables investigated. From the surveyed sample, 52.6% were female, 72.8% were white, and 79.2% were from public schools.

Table 2 Unadjusted and Adjusted Analysis of Dental Pain Occurrence (Poisson Regression Analysis)

Independent variables	PRu (95% CI)	P	PRa (95% CI)	P
Socioeconomic/demographic				
Family income (quartile)		< .001		.001
1st (R$ 1,231–12,000	1		1	
2nd (R$ 741–1,230)	1.07 (0.83–1.38)		1.07 (0.83–1.37)	
3rd (R$ 511–740)	1.35 (1.06–1.72)		1.33 (1.04–1.70)	
4th (R$ 0–510)	1.44 (1.14–1.81)		1.39 (1.10–1.76)	
Maternal schooling (y)		.001		
>12	1		–	
8–12	1.16 (0.92–1.46)			
< 8	1.41 (1.13–1.77)			
School type		.009		–
Private	1			
Public	1.19 (0.97–1.46)			
Sex		.003		.009
Male	1		1	
Female	1.26 (1.08–1.48)		1.24 (1.06–1.46)	
Age		.034		.123
8	1		1	
9	1.02 (0.79–1.32)		1.05 (0.79–1.38)	
10	0.94 (0.72–1.22)		0.96 (0.72–1.27)	
11	1.09 (0.84–1.42)		1.09 (0.82–1.45)	
12	1.35 (1.03–1.76)		1.26 (0.94–1.69)	
Skin Color		.009		–
White	1			
Non-white	1.24 (1.05–1.45)			
Psychosocial				
Family structure		.001		.075
Nuclear	1		1	
Non-nuclear	1.29 (1.11–1.50)		1.16 (0.99–1.36)	
Number of people in household		.008		.048
2–4	1		1	
5	1.14 (0.94–1.39)		1.11 (0.91–1.36)	
≥6	1.28 (1.06–1.54)		1.23 (1.01–1.49)	
School delay		.001		–
No	1			
Yes	1.29 (1.10–1.51)			
Dental fear		.005		.045
No/Yes, a little	1		1	
Yes/Yes, a lot	1.26 (1.07–1.48)		1.19 (1.00–1.42)	
Biologic				
DMFT		< .001		< .001
0	1		1	
≥1	1.64 (1.41–1.90)		1.57 (1.34–1.84)	

PRu = unadjusted prevalence ratio; PRa = adjusted prevalence ratio; 1R$ = 0.54US$; – variables not included in the final model; DMFT = decayed, missing, and filled teeth.

Mean age was 9.93 (± 1.27) years. The proportion of children with dental pain in the last 6 months was 35.7% (95% CI 33.0–38.5) and in the last 4 weeks was 17.3% (95% CI 15.2–19.5) (Table 1). Prevalence of pain in the last 6 months was higher in girls than in boys, and dental pain report increased with age (33.7% at 8 years vs 45.% at 12 years of age). The higher prevalence of dental pain in the previous 6 months was associated with children with non-white skin, mothers with lower schooling, non-nuclear families, lower family income, higher household crowding, and children with dental caries. Fearful children reported a higher frequency of pain. Children who considered their teeth as poor and who reported being disturbed by the oral health condition reported dental pain more frequently than their counterparts without pain.

The results of the unadjusted and adjusted analysis for factors associated with dental pain reported in the last 6 months are shown in Table 2. After adjustments, there was a highly significant relationship between dental pain and (a) family income (PR 1.39; 95% CI 1.10–1.76), with children from the lower range of income families presenting higher prevalence of pain; (b) sex (PR 1.24; 95% CI 1.06–1.46), with girls being more affected than boys; (c) household crowding (PR 1.23; 95% CI 1.01–1.49), with people living in crowded houses being more affected than their counterparts; (d) dental fear (PR 1.19; 95% CI 1.00–1.42), with fearful children reporting more pain; and (e) dental caries experience (PR 1.57; 95% CI 1.34–1.84), with people who had this experience reporting higher frequency of pain. Maternal school-

Table 3 Influence of Dental Pain in Oral Health Perception and Impact in Daily Life (Poisson Regression Analysis)

Dental pain	Oral health perception	PR (95% CI)	P	Oral health impact[†]	PR (95% CI)	P
Unadjusted	Positive	1.00	≤ .001	Absent	1.00	≤ .001
	Negative	2.27 (1.62–3.20)		Present	2.02 (1.77–2.30)	
Adjusted*	Positive	1.00	≤ .001	Absent	1.00	≤ .001
	Negative	2.56 (1.55–3.29)		Present	1.89 (1.64–2.17)	

*Adjusted for: family income, sex, age, family structure, household crowding, DMFT, dental trauma, and malocclusion.
[†]Measured by Locker's global oral health item.
PR = prevalence ratio.

ing, school type, age, skin color, family structure, and school delay were statistically significant with dental pain prevalence in unadjusted analysis, but this association disappeared when adjusted for the variables in the multivariable model.

Table 3 presents the influence of dental pain on oral health perception and its impact on daily life. After adjustments for demographic, socioeconomic, and clinical variables, dental pain remained associated with impaired oral health perception (PR 2.56; 95% CI 1.55–3.29) and with increased oral health impact (PR 1.89; 95% CI 1.64–2.17).

Discussion

This school-based cross-sectional survey assessed the report of dental pain in a sample of 8- to 12-year-old children in South Brazil. The prevalence of dental pain in the last 6 months (35.7%) and in the last 4 weeks (17.3%) was high in the present study. Results were very similar to a population-based Brazilian Oral Health Survey, in which the prevalence of dental pain in adolescents in the last 6 months was 35.6%,[30] and also similar to a Brazilian School-Based Health Survey, in which the report of pain in the last 4 weeks was 17.6%.[25] The prevalence found in the present study was higher than that found by Roth-Isigkeit et al, who evaluated children and adolescents between 4 and 18 years of age in a developed country (Germany). There, the authors observed that 11.7% of the sample had experienced pain during the preceding 3 months.[31] However, compared to a country in the process of development, the prevalence found in the present study was quite low. In a community-based cross-sectional study evaluating 12-year-old children in the Nellore District of Andhra Pradesh (India), 77.4% of the children reported having experienced dental pain in the past month.[32]

In the present study, a series of sociodemographic, biologic, psychosocial, and behavioral conditions was assessed and associated with dental pain in schoolchildren. A higher prevalence of dental pain was reported by girls than by boys. Bastos et al[33]

have pointed out that such a difference could reflect, in general, socially learned behaviors, because children at this age have already had contact with social norms and values. At early ages (preschool children), there is no difference in dental pain reported between boys and girls and such a result could be related to the lack of establishment of social behavior in these early ages.[34] The stereotype of masculinity, for example, could have produced a need for boys to appear more resistant to pain and this could have led them to report pain less often. Previous reports have also shown a higher prevalence of pain in girls in this age range.[25] However, it is important to consider that the effect of gender on experimental pain has shown higher pain sensitivity in women than in men, probably due to differences in sex hormones or in the function of the endogenous opioid system.[35] In addition, the 2000–2005 US National Health Interview Survey found that women self-reported a higher prevalence of common pains (namely, temporomandibular joint and muscle disorder pain, headache, neck and back pain) than men.[36]

Socioeconomic characteristics could influence the occurrence of dental pain, because more wealthy and/or higher educated individuals have a greater chance of living in better-quality housing and basic facilities, which could prevent infections and diseases.[34] Moreover, these groups could have a greater chance of developing healthy habits in oral health and make healthier choices in their diets, as well as have higher access to oral care products.[34] Besides the effect of socioeconomic conditions on access to goods and services that promote health and differences in exposures to risk factors and health behaviors, socioeconomic status has been shown to influence perception about health, even after accounting for differences in levels of oral disease.[37,38] According to Locker, it is not unreasonable to suggest that childhood circumstances influence children's psychologic assets and psychosocial resources and, consequently, their experience of oral diseases and disorders.[37]

The positive association between the number of people living in the same house and the report of pain

might be related to the socioeconomic status of the children's families, since crowded houses may reflect poor socioeconomic status, and account for the relationship between socioeconomic status and oral health status.[39] In situations of poverty, people have less opportunity to promote oral health, both in terms of preventive care and regular dental visits, which could be reflected in a poor oral health condition and, consequently, higher dental pain. Consistent with the findings of the present study, Villalobos-Rodelo et al observed that 6- to 12-year-old Mexican schoolchildren belonging to a larger-sized family were more likely to have visited the dentist in the previous year due to dental pain.[40]

Dental caries, as expected, was highly associated in the present study with the report of dental pain. Despite its decrease in the last few decades, dental caries is still highly prevalent in children in Brazil,[14] and most carious lesions remain untreated in children.[41,42] Nomura et al[3] assessed dental pain among 12- and 13-year-old schoolchildren in Brazil and found that children with a DMFT > 1 were 2.9 more likely to have dental pain when compared with those with a DMFT ≤ 1.

The findings of the present study that fearful children tend to report dental pain more often is in agreement with a previous study showing that a fearful child is more prone to perceive and rate pain intensity more strongly compared with nonfearful children.[43] Likewise, most invasive treatments and everyday events were considered significantly more painful by children with an elevated dental anxiety and fear.[17] It might be assumed that patients with dental anxiety and fear tend to avoid dental treatment,[44] being reluctant to visit a dentist until they are in considerable discomfort or pain. This would explain the less frequent dental visits of many fearful people and the symptomatic visiting patterns, considering that people with high dental fear are more likely to delay treatment and thus experience more extensive dental problems.[44] Recently, in a birth cohort at age 5, a positive association was found in children between the frequent experience of dental pain and higher dental fear.[45]

The consequences of dental pain on oral health perception in children were also investigated in the present study. Toothache is an important problem affecting the lives of children and also of their parents.[46] Another study based on reports of parents or guardians in Brazil found that the daily activities most affected by dental pain were eating, brushing of the teeth, and sleep; these are essential activities for child development and maintenance of health.[47] In the present study, it was observed that children who suffered from dental pain reported discomfort related to the teeth more frequently than those who did not suffer from this problem. Also, the children's self-per-

ception related to the teeth was impacted by dental pain, since a higher prevalence of pain was associated with a worse perception about their teeth. This finding may help to raise awareness with parents, teachers, and health care providers of the impact of toothache on the quality of life of young children.[48] Measuring the impact on daily life and on oral health perception, as a complement to the assessment of oral health needs, allows health care professionals to evaluate the efficacy of treatment protocols and the quality of care from the patient perspective.[49]

Considering the subjectivity of pain, and also that the experience of pain varies greatly between individuals, the objective evaluation of pain is a challenge. Furthermore, there are several instruments used to assess the intensity, duration, emotional dimension, and quality of the pain. However, most studies are limited to measuring prevalence of pain through closed questions, evaluating mostly periods of pain reported in the last 4 weeks or 6 months.[6,25,50] The possibility of recall bias on the children's report of pain should be considered as a limitation of the present study, as information about pain was collected retrospectively from children. The period prevalence, which is the frequency of an existing disease or condition during a defined period of time, was adopted.[50] There are in the literature wide variations in the periods of time for recalling pain experience, from point prevalence[51] to prevalence over the past 12 months.[52,53] However, since the measurement of pain depends crucially on the memory of participants, a shorter period, such as 4 weeks, decreases the risk of recall bias. Nonetheless, the evaluation over a longer period, such as 6 months, enables the assessment of pain resulting from chronic diseases, which cannot be assessed in an analysis based on 4 weeks. For this reason, the present study used a period of 6 months for the associations and impacts related to dental pain. Despite having used these two time frames, a limitation of the present study is the evaluation adopted, which only measures the prevalence of pain, and it was not able to evaluate the intensity or magnitude of the pain.

One of the major strengths of the present study is the external validity. According to local authorities, nearly all children in this age range in Pelotas are enrolled in schools, and methodological procedures ensured a representative sample of the population was obtained. Furthermore, another strength is the use of validated instruments and questions that allow for comparisons of the present findings with previous and future studies. On the other hand, the design of the present study limited causal inferences, because exposure variables and outcomes were assessed in the same period of time. Also, although the response rate could be considered low (69.4% of the eligible

population), the number of children examined by this study was greater than the required minimum based on sample size calculations, and the final sample had a statistical power of 80%. It might be speculated that those children who did not return the informed consent form signed by their parents were those with a major burden of dental pain. Even though it was not possible to assess this information, sampling bias is unlikely to be present, taking into consideration that the prevalence found in the present study was almost equal of that found in a Brazilian National School-Based Survey[25]; this strengthens the results and indicates that the findings are reliable.

The findings of this school-based survey indicate that a high percentage of schoolchildren suffer from dental pain that has a negative impact on their oral health perception. The data indicate that, in this group of children, demographic, socioeconomic, psychosocial, and biologic characteristics were associated with the occurrence of dental pain. From a public health approach, the findings indicate that considerable attention should be given to the social inequality in the distribution of dental pain, and public policies focusing on groups with the higher risk of disease should be established. Also, taking into account the alarming prevalence of schoolchildren with dental pain and its close relationship with dental caries, community-based or school-based health policies should be encouraged that aim to establish prevention strategies in an effort to reduce the prevalence of major oral diseases and likely the damage caused by these problems.

Acknowledgments

References

1. Pau A, Khan SS, Babar MG, Croucher R. Dental pain and care-seeking in 11-14-yr-old adolescents in a low-income country. Eur J Oral Sci 2008;116:451–457.
2. Slade GD. Epidemiology of dental pain and dental caries among children and adolescents. Community Dent Health 2001;18: 219–227.
3. Nomura LH, Bastos JL, Peres MA. Dental pain prevalence and association with dental caries and socioeconomic status in schoolchildren, Southern Brazil, 2002. Braz Oral Res 2004;18: 134–140.
4. Pau A, Baxevanos KG, Croucher R. Family structure is associated with oral pain in 12-year-old Greek schoolchildren. Int J Paediatr Dent 2007;17:345–351.
5. Pau AK, Croucher R, Marcenes W. Prevalence estimates and associated factors for dental pain: A review. Oral Health Prev Dent 2003;1:209–220.
6. Locker D, Grushka M. The impact of dental and facial pain. J Dent Res 1987;66:1414–1417.
7. Goes PS, Watt R, Hardy RG, Sheiham A. The prevalence and severity of dental pain in 14-15 year old Brazilian schoolchildren. Community Dent Health 2007; 24:217–224.
8. Barrêtto ER, Paiva SM, Pordeus IA, Ferreira e Ferreira E. Validation of a child dental pain questionnaire instrument for the self-reporting of toothache in Children. Pediatr Dent 2011; 33:228–232.
9. Locker D. The symptom iceberg in dentistry. Treatment-seeking in relation to oral and facial pain. J Can Dent Assoc 1988; 54:271–274.
10. Mashoto KO, Astrøm AN, David J, Masalu JR. Dental pain, oral impacts and perceived need for dental treatment in Tanzanian school students: A cross-sectional study. Health Qual Life Outcomes 2009;7:73.
11. Atchison KA, Davidson PL, Nakazono TT. Predisposing, enabling, and need for dental treatment characteristics of ICS-II USA ethnically diverse groups. Adv Dent Res 1997;11:223–234.
12. Comunello SMH. Dor dental e impacot nas atividades diárias: um estudo de prevalência em estudantes de 12 anos, Joaçaba e Herval d'Oeste, Brasil, Universidade do Oeste de Santa Catarina – UNOESC. 2003.
13. Boeira, GF, Correa MB, Peres KG, et al. Caries is the main cause for dental pain in childhood: Findings from a birth cohort. Caries Res 2012;46:488–495.
14. Traebert J, Lacerda JT, Fischer TK, Jinbo Y. Dental caries and orofacial pain trends in 12-year-old school children between 1997 and 2003. Oral Health Prev Dent 2005;3:243–248.
15. Eli I. Oral Psychophysiology: Stress, Pain and Behavior in Dental Care. Boca Raton: CRC Press, 1992.
16. Maggirias J, Locker D. Psychological factors and perceptions of pain associated with dental treatment. Community Dent Oral Epidemiol 2002;30:151–159.
17. Krekmanova L, Bergius M, Robertson A, et al. Everyday- and dental-pain experiences in healthy Swedish 8-19 year olds: An epidemiological study. Int J Paediatr Dent 2009;19:438–447.
18. Goettems ML, Correa MB, Vargas-Ferreira F, et al. Methods and logistics of a multidisciplinary survey of schoolchildren from Pelotas, in the Southern Region of Brazil. Cad Saude Publica 2013;29:867–878.
19. Schuch HS, dos Santos Costa F, Torriani DD, Demarco FF, Goettems ML. Oral health-related quality of life of schoolchildren: Impact of clinical and psychosocial variables. Int J Paediatr Dent 2014. doi:10.1111/ipd.12118.
20. Thomson WM, Mejia GC, Broadbent JM, Poulton R. Construct validity of Locker's global oral health item. J Dent Res 2012;91: 1038–1042.
21. Jokovic A, Locker D, Tompson B, Guyatt G. Questionnaire for measuring oral health-related quality of life in eight- to ten-year-old children. Pediatr Dent 2004;26:512–518.
22. Martins MT, Ferreira FM, Oliveira AC, et al. Preliminary validation of the Brazilian version of the Child Perceptions Questionnaire 8–10. Eur J Paediatr Dent 2009;10:135–140.
23. Neverlien PO. Assessment of a single-item dental anxiety question. Acta Odontol Scand 1990;48:365–369.
24. Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira - INEP. Estatísticas Educacionais. Educação Básica. http://dados.gov.br/dataset/taxas-de-distorcao-idade-serie-escolar-na-educacao-basica. Accessed in 03 March, 2014.

25. Freire MOC, Leles CR, Sardinha LM, Paludetto Junior M, Malta DC, Peres MA. Dental pain and associated factors in Brazilian adolescents: The National School-Based Health Survey (PeNSE), Brazil, 2009 [in Portuguese]. Cad Saude Publica 2012;28 Suppl:s133–s145.

26. Instituto Brasileiro de Geografia e Estatística. Manual do recenseador. IBGE 2000;1:151.

27. WHO. 1999. Oral Health Surveys: Basic Methods. 4th ed. Geneva: World Health Organization. 1997.

28. O'Brien M. Children's dental health in the United Kingdom 1993. London: Her Majesty's Stationery Office. 1994.

29. Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: An empirical comparison of models that directly estimate the prevalence ratio. BMC Med Res Methodol 2003;3:21.

30. Borges CM, Cascaes AM, Fischer TK, Boing AF, Peres MA, Peres KG. Dental and gingival pain and associated factors among Brazilian adolescents: An analysis of the Brazilian Oral Health Survey 2002–2003. Cad Saude Publica 2008;24: 1825–1834.

31. Roth-Isigkeit A, Thyen U, Stöven H, Schwarzenberger J, Schmucker P. Pain among children and adolescents: Restrictions in daily living and triggering factors. Pediatrics 2005;115:e152–e162.

32. Dandi KK, Rao EV, Margabandhu S. Dental pain as a determinant of expressed need for dental care among 12-year-old school children in India. Indian J Dent Res 2011;22:611.

33. Bastos JL, Antunes JLF, Frias AC, Souza MLR, Peres KG, Peres MA. Color/race inequalities in oral health among Brazilian adolescents. Rev Bras Epidemiol 2009;12:313–324.

34. Bastos JL, Nomura LH, Peres MA. Dental pain, socioeconomic status, and dental caries in young male adults from southern Brazil. Cad Saude Publica 2005;21:1416–1423.

35. Berkley KJ. Sex differences in pain. Behav Brain Sci 1997; 20:371–380.

36. Plesh O, Adams SH, Gansky SA. Racial/Ethnic and Gender Prevalences in Reported Common Pains in a National Sample. J Orofac Pain 2011;25:25–31.

37. Locker D. Disparities in oral health-related quality of life in a population of Canadian children. Community Dent Oral Epidemiol 2007;35:348–356.

38. Taylor SE, Seeman TE. Psychosocial resources and the SES-health relationship. Ann N Y Acad Sci 1999;896:210–215.

39. Treasure E, Kelly M, Nuttall N, Nunn J, Bradnock G, White D. Factors associated with oral health: A multivariate analysis of results from the 1998 Adult Dental Health survey. Br Dent J 2001;190:60–68.

40. Villalobos-Rodelo JJ, Medina-Solís CE, Maupomé G, Lamadrid-Figueroa H, Casanova-Rosado AJ, Casanova-Rosado JF. Dental needs and socioeconomic status associated with utilization of dental services in the presence of dental pain: A case-control study in children. J Orofac Pain 2010;24:279–286.

41. Goettems ML, Ardenghi TM, Demarco FF, Romano AR, Torriani DD. Children's use of dental services: Influence of maternal dental anxiety, attendance pattern, and perception of children's quality of life. Community Dent Oral Epidemiol 2012;40:451–458.

42. Leal SC, Bronkhorst EM, Fan M, Frencken JE. Untreated cavitated dentine lesions: Impact on children's quality of life. Caries Res 2012;46:102–106.

43. Klaassen MA, Veerkamp JS, Hoogstraten J. Dental fear, communication, and behavioural management problems in children referred for dental problems. Int J Paediatr Dent 2007;17:469–477.

44. Armfield JM, Stewart JF, Spencer AJ. The vicious cycle of dental fear: Exploring the interplay between oral health, service utilization and dental fear. BMC Oral Health 2007;7:1.

45. Torriani DD, Ferro, RL, Peres KG, et al. Dental fear in childhood: Prevalence and associated factors in a birth cohort study. Caries Res 2014;48:263–270.

46. Honkala E, Honkala S, Rimpelä A, Rimpelä M. The trend and risk factors of perceived toothache among Finnish adolescents from 1977 to 1997. J Dent Res 2001;80:1823–1827.

47. Moura-Leite FR, Ramos-Jorge J, Ramos-Jorge ML, Paiva SM, Vale MP, Pordeus IA. Impact of dental pain on daily living of five-year-old Brazilian preschool children: Prevalence and associated factors. Eur Arch Paediatr Dent 2011;12:293–297.

48. Versloot J, Veerkamp JS, Hoogstraten J. The dental discomfort questionnaire: The basis of a 'Toothache Traffic Light'. Eur Arch Paediatr Dent 2009;10:67–70.

49. Kramer PF, Feldens CA, Ferreira SH, Bervian J, Rodrigues PH, Peres MA. Exploring the impact of oral diseases and disorders on quality of life of preschool children. Community Dent Oral Epidemiol 2013;41:327–335.

50. Peres MA, Peres KG, Frias AC, Antunes JL. Contextual and individual assessment of dental pain period prevalence in adolescents: A multilevel approach. BMC Oral Health 2010;10:20.

51. Gilbert GH, Duncan RP, Heft MW, Dolan TA, Vogel WB. Oral disadvantage among dentate adults. Community Dent Oral Epidemiol 1997;25:301–313.

52. Cushing AM, Sheiham A, Maizels J. Developing socio-dental indicators—The social impact of dental disease. Community Dent Health 1986;3:3–17.

53. Sternbach RA. Pain and 'hassles' in the United States: Findings of the Nuprin pain report. Pain 1986;27:69–80.